PUENTE SAN ANTONIO
(Bridge No. 1)
Puerta de Tierra-Miramar Neighborhoods
Spanning the San Antonio Channel at PR-1
San Juan
San Juan County
Puerto Rico

HAER No. PR-35

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
Southeast Region
National Park Service
Department of the Interior
Atlanta, Georgia 30303

HAER PR 7-SAJU, 62-

HISTORIC AMERICAN ENGINEERING RECORD

PUENTE SAN ANTONIO (Bridge No. 1) HAER No. PR-35

Location:	PR-1 (Luis Muñoz Rivera Avenue), km. 3.8, spanning the San Antonio Channel Puerta de Tierra/Miramar Neighborhoods San Juan San Juan County Puerto Rico U.S.G.S. 7.5 minute San Juan, Puerto Rico, quadrangle Universal Transverse Mercator coordinates: 1323 II SE.807630.2043565
Date of Construction:	1924-1925
Engineer:	Eng. Rafael Nones, Designer
Builder:	Eng. Robert Prann, Contractor
Present Owner:	Puerto Rico Department of Transportation and Public Works
Present Use:	Vehicular traffic (projected for demolition 2000)
Significance:	Puente San Antonio was constructed in 1924-25 to carry a new highway serving the dock area of the San Juan islet. It was erected parallel to existing highway, railroad and trolley bridges spanning the San Antonio Channel. Located within one of the most attractive urban areas of the Caribbean, this bridge lies today next to one of Puerto Rico's few remaining railroad bridges and near the modern occupant of the island's most historic bridge site. Puente San Antonio, designed and built respectively by Rafael Nones and Robert Prann, both renowned engineers, is listed in Puerto Rico's Inventory of Historic Bridges and mentioned in the Multiple Property Nomination of Puerto Rico's Bridges and its Associated Historic Context, Land Transportation in Puerto Rico, c.1508-1950 as an exceptional beam bridge due to its monumental style. Although its standard beam structure is not considered significant in engineering terms, important items provide historic significance to the San Antonio Bridge: total length; number of spans; decorative elements; exemplification of the work of masters; the important route that it serves; and its surroundings.
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Date:	July, 1998

A. INTRODUCTION

Puente San Antonio, also known as Bridge No. I (see photo I), carries Route PR-1 over the San Antonio Channel. This channel, which connects San Juan Bay to the west with the Condado Lagoon to the east, separates the islet of San Juan, site of this capital's historic city center, from Puerto Rico's main island.

The highway carried by this bridge is called Luis Muñoz Rivera Avenue to its north and Manuel Fernández Juncos Avenue to its south. It is the main artery carrying outbound traffic south from the islet of San Juan into its suburbs and to the rest of Puerto Rico. This structure belongs to the Puerto Rico Department of Transportation and Public Works.

The Location Plan (page 9) shows the whereabouts of Puente San Antonio. It is located at PR-1, kilometer 3.8, between the Puerta de Tierra (north) and Miramar (south) neighborhoods of the municipality of San Juan. San Juan, the capital of Puerto Rico, is located on the island's north coast.

Just east of Puente San Antonio lies the abandoned railroad bridge Puente Ferroviario San Antonio (HAER No. PR-37), while Puente Guillermo Esteves (HAER No. PR-36) is just beyond the latter. The first is one of Puerto Rico's very few remaining railroad bridges; it is now abandoned and used for pedestrian and recreational purposes. The Esteves bridge is the fourth structure to occupy its site since about 1520; it was preceded by a causeway, an oft reconstructed stone arch bridge, and a short-lived iron lattice girder bridge. The steel trestle bridge serving San Juan's trolley line, which existed at the time that Puente San Antonio was built, lay between the railroad and Esteves bridges. The base of its piers are still at the bottom of the channel.

This bridge is listed in the "Puerto Rico Historic Bridge Inventory Project", which evaluated and selected highway and railroad bridges built on or before 1945. It is also mentioned in the Multiple Property Nomination of Puerto Rico's Bridges and its Associated Historic Context, Land Transportation in Puerto Rico, c.1508-1950, as a monumental, exceptional girder bridge. Although its standard beam structure is not significant in engineering terms, there are several elements which provide significance: length; number of spans; decorative elements; exemplification of the work of masters; the very important route that it serves; and its surroundings.

This bridge is to be replaced due to the extreme corrosion of the steel elements and the deterioration of its concrete parts. As part of the corresponding bridge replacement project, this bridge has been documented and photographed according to archival standards at HABS/HAER's Level 2, as agreed in a Memorandum of Agreement.

B. DESCRIPTION AND CONDITION

The monumental style of Puente San Antonio conceals behind its decorative facade arches (see photo 7) a commonplace, concrete slab-deck over a concrete-encased steel beam structure (see photo 9).

It is 100.9 meters long, which was a very long bridge by contemporary standards in Puerto Rico (see sketch drawing and photo 5). It consists of eight 10.00-meter spans and two additional 10.46 meter spans, one at each end. The spans are supported by reinforced concrete piers resting on concrete piles. Its piers end in circular buttresses which rise to a belt course (see photo 3). Its total width is 21.52 meters, and the roadway's width is 16.00 meters. It clears 4.10 meters over the channel's mean water elevation.

Its decorative lighting fixtures in cast iron, the ornamental corner posts (see photo 8), and the concrete balustrade shaped as ornamental blocks (see photo 4) combine with the arch facade and buttressed piers to make it an attractive structure. Its facade and scale blend well with those of its neighboring bridges (Esteves and railroad) and with the surrounding coastal elements and structures, contributing to a very attractive urban landscape.

A group of San Juan fishermen use wood-enclosed spaces beneath and between the northem end this structure and its neighboring railroad bridge to keep their boats and fishing equipment. Enclosed and open wooden platforms, supported above the water by wood piles and sometimes roofed by the bridges' northernmost spans, serve them as headquarters and outlet store (see photo 5, background). Some of them occasionally live in these spaces.

The steel girders and their concrete encasement, the concrete substructure and foundations, and the west facade of the bridge are in poor condition. Most of its decorative elements are still present and sound, although the railings have been repaired countless times.

C. HISTORICAL BACKGROUND [1]

Although Columbus landed in Puerto Rico in 1493, Spanish settlement of the island did not begin until early in the next century under Juan Ponce de León. For defensive reasons, Ponce de León established the capital, Caparra, about two kilometers south of San Juan Bay, in a region surrounded by wetlands. San Juan's bay is formed by the dry, rocky Isle of San Juan in the north and the hills and mangroves of the north coast of the main island. The narrowest body of water between the Isle and the main island is the San Antonio Channel.

Inaccessibility and mosquitoes forced the settlers to move the capital city from Caparra to the westem tip of the Islet of San Juan. This elongated sandstone formation forms the bay and protects it from the Atlantic Ocean. It is separated from the main island by the San Antonio Channel, which may have been approximately 200 meters across at that time. The island's first road linked Caparra with the capital's new location on the Isle. Built between 1520 and 1521, it included the first two bridges of any significance built on the island. One crossed the San Antonio Channel and the other one the Martín Peña Channel. This road, which was paved around 1850 between San Juan and the Martín Peña bridge, remained the only land link between San Juan and its hinterland in the main island until the 1880s.

THE FIRST BRIDGE ACROSS THE SAN ANTONIO CHANNEL

The first bridge over the San Antonio Channel, partly corresponding to the site of today's Puente Guillermo Esteves, was, for most of its length, a two-part stone causeway linking the low, southeastem end of the Isle with the firm ground adjacent to the hills of Miramar in the main island. It was erected by enslaved Indians working under Jerónimo priests between 1520 and 1521. the main island. It was erected by enslaved Indians working under Jerónimo priests between 1520 and 1521.

The northern section of causeway corresponded to the straight, masonry-protected western edge of the entrance to the Condado Lagoon. This entrance was known in those days as "Caleta del Boquerón". Today, this edge extends northward from the intersection of the Ponce de León and Ashford Avenues, contiguous to the northern abutment of the existing structure. The southem part is said to have deviated about 20 degrees from the present alignment of the Guillermo Esteves Bridge.[2] Between the two sections of causeway was a small open space for the passage of water and boats. This space, spanned by a wooden bridge, may have corresponded approximately to the northemmost span of the modem day structure.

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1 Most of this section is based on Pumarada, *Los puentes...*

2 Vega, "Evaluación..." The earliest graphic representations that show the bridge in its context seem to be drawings made by Dutch invaders c.1625. These show a steeper angle between both spans of causeway in comparison to posterior plans which do correspond with today's characteristics. These Dutch drawings, however, give a poor overall representation of that part of the islet and the lagoon. On the other hand, the presence of a steeper angle does not make military sense, nor seems compatible with the shape of the lagoon. We can infer then that these are not trustworthy drawings.

In 1558 an aqueduct was built over the causeway to bring water from a spring, Fuente de Aguilar, in the main island.[3] The water flowed into a deposit located north of the bridge's abutment in the Isle of San Juan, several meters. Since then, the structure has been unofficially known as "Puente del Agua" (the water's bridge").

In 1568 the wooden bridge between the two causeway sections was reconstructed. At the southern end of the northern causeway, next to the wooden structure, a large gate had been built with an adjoining guard house. A garrison, provided with pieces of artillery, was permanently stationed there to defend the bridge and the eastern end of the Isle. As early as 1586, a triangular fort and a pair of 20 foot long walls defended the gate.[4] As a result, the bridge had also become known by the name "Puente de los Soldados" (the soldier's bridge). The gate into the islet was closed at night.

George Clifford, Earl of Cumberland, found his efforts to conquer Puerto Rico in 1598 foiled by these forces, then commanded by militia officer Bernabé de Serralta. Serralta and his men resisted a force of about one thousand enemies, wounding Clifford as he attempted to cross over the causeway. However, the causeway and its bridge were almost totally obliterated by the attackers' artillery.

OTHER EARLY VERSIONS

Upon its reconstruction in 1608-1613, a stone arch bridge was built in place of the southern part of the causeway. The stone bridge kept a small span made of wood to permit disassembly for defensive reasons. The northern part of the causeway was repaired and on its widened southern end a larger fortification was erected in stone. It was called "Fortín San Antonio". The fort and its large gate were integrated to the bridge abutment in such a way that the bridge ended right against the fort's door. People, animals and vehicles entering the Isle had to cross the fort's solid, heavy, two-meter wide gate and walk through the middle of the fort, defended by soldiers and artillery.

These must have been the structures represented in the drawings of San Juan made by the Dutch attackers of 1625. Hendricks, the Dutch leader, avoided the fortified bridge and risked entering the bay with his fleet right through its mouth, defended by the much larger fort called San Felipe del Morro. However, Morro's artillery was faulty and the Dutch were able to burn and loot San Juan.

In 1660 the bridge was again repaired and the wooden section rebuilt in stone. The bridge was then 4.8 meters wide and consisted of three segmented arches, each spanning approximately five meters, plus an approach causeway.

In 1776, concurrently with the enhancement of the defensive works protecting the city and the Isle, the stone bridge was rebuilt over pile foundations and the fort enlarged.[5] This work was conducted by the renowned military engineer Thomas O'Daly.

In 1797 a British fleet of sixty ships commanded by Ralph Abercromby disembarked between six and seven thousand men about two miles east of the bridge's southern end. The main objective of these forces was the Fortín San Antonio and its bridge. They placed artillery at two points, one in Condado, across the forts of San Jerónimo and Escambrón, and the other at Monte Olimpo in Miramar, above the San Antonio bridge. In April 24th, they opened fire against the three forts. The Fortín San Antonio was practically destroyed. Even still, the British could not cross the bridge thanks to the fierce defense of Captain Ignacio Mascaró and his men, stationed behind

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3 Name given to it because Miguel de Aguilar was the name of the owner of the property where the spring was located.

4 Vega, "Evaluación..."

5 Vega, "Evaluación..."

barriers made of sandbags, arranged among the fort's ruins. Having been defeated in other attacks, the British left Puerto Rico the 3rd of May.[6]

THE BRIDGE BECOMES PART OF THE CARRETERA CENTRAL

Except in military terms, the role of Puerto Rico in the Spanish New World Empire was minor during its first three hundred years of Spanish rule. The port of San Juan remained a critical defensive link for the Spanish Caribbean and a key port in the route of the treasure fleets. Spain had fortified the port and the access routes to the city since the 16th Century, and maintained a detachment of soldiers which defended them successfully in several occasions. By the mid-seventeenth century, while San Juan became a walled city in a rocky islet guarded by a fortified bridge, Puerto Rico's economic activity was limited to a few cattle ranches and a handful of small cane sugar and tobacco plantations, plus disperse logging and small-scale ginger and hog production for smuggling.

However, in the second half of the eighteenth century there came about structural changes occurring concurrently with economic and population growth which required more and better transportation facilities. In the 1820s the colonial government improved San Juan's communications with its hinterland. Before the 1840s there had been practically no paved highways in Puerto Rico, but in 1846, as the bridge over the Martín Peña Channel was being totally reconstructed, the construction of the 41 kilometers of macadam paved highway between San Juan and Caguas was begun. The San Juan-Río Piedras stretch, which included the San Antonio Channel Bridge, was finished by 1853.

A highway plan was developed in the second half of the century; it included a first order highway from San Juan to Ponce passing through Caguas, Cayey, Aibonito, Coamo and Juana Díaz. This route across the humid, rugged Central Mountain Range became the government's main priority because the coasts were being served by scheduled coastal shipping. The existing highway between San Juan and Rio Piedras, which contained the San Antonio and Martín Peña bridges, became the first official stretch of this route, which had been named the Carretera Central.

The highway was completed in 1886. With 134 kilometers, 33 roadmen's houses, and 13 permanent bridges, it had become a monument to Spanish and Puerto Rican engineering.

NEW VERSIONS OF THE HIGHWAY BRIDGE AND A TROLLEY BRIDGE

The year 1880 saw the establishment of a small steam-powered passenger train between San Juan and Río Piedras. This commuter railroad, which consisted of a small steam engine pulling two passenger cars over one-meter gage rail, crossed the San Antonio Channel over the Puente del Agua highway bridge. About six years later, the railroad company built its own steel trestle bridge west of the highway bridge. This small railroad was converted into an electric trolley line about 1904.

After major repair work performed in 1827, the highway bridge had essentially remained unchanged until in 1894. On that date the centuries old and often reconstructed stone structure was finally replaced by a metal structure designed by engineer Joaquín Gisbert. This new bridge had vaulted masonry access spans and four lattice open-web lateral beam metal spans resting on stone piers over wood piles. The iron spans added up to a total length of 55.5 meters. The northernmost of these spans was designed for quick disassembly to allow better defense of the capital and its bay in case of enemy attack. Its metal spans were seven meters wide; imported from France in pieces. Three of these spans measured 15.8 meters each; the fourth, disassemblable one, which was supported at its north end directly on the fort's foundations, measured 8 meters long.

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6 This action is represented in a contemporary painting by José Campeche that includes the Fort. The Fort depicted is very similar to the later reconstruction, of which photos are kept from the end of the nineteenth century.

In 1926-27 the present concrete and steel highway bridge, more than twice as wide as the 1894 version, was erected. First one half of its width was built just west of the lattice beam bridge, and then, with traffic using this half, the iron bridge was replaced by the other half of the present bridge. This version of the bridge (HAER No. PR-36) was named Puente Guillermo Esteves, after the current Commissioner of Public Works.

THE RAILROAD CROSSES THE SAN ANTONIO CHANNEL

A franchise had been granted in 1888 to the French-owned Compañía Ferrocarrilera de Puerto Rico (C.F.P.R.) to build and operate a railroad which would encircle the island. However, C.F.P.R. was short of capital and it suspended construction work in 1893. C.F.P.R. erected a French-built steel through-truss bridge over the San Antonio Channel which was inaugurated in 1891. The San Juan-Martín Peña - Camuy line, and three other stretches which were in service in 1893, totaling 270 kms., remained the only existing ones until 1902. The American Railroad of Puerto Rico (A.R.R.), a US firm, bought the franchise on that date and completed the San Juan-Ponce route in 1906.

By 1898, year of the American invasion of Puerto Rico, the islet of San Juan was joined to Miramar in the main island by three metal bridges over the San Antonio channel. These were: the highway bridge, the commuter train bridge, and the C.F.P.R. railroad bridge.

About 1896, the Porto Rico Railway, Ice and Power Co., a Canadian-owned firm, bought the commuter train and by 1904 had substituted the small steam system by electric trolley cars. In August, 1912 permission was granted to widen its bridge to serve a double rail for its trolley cars. This bridge, whose steel structure contrasted sharply with its gently-arched concrete neighbors and was considered an eye-sore by many, was destroyed shortly after the trolley folded in the early 1950s. The bases of its steel trestles remain underwater.

The original C.F.P.R. truss bridge was replaced by the existing concrete bridge due to corrosion problems. The present bridge, designed and produced by noted Puerto Rican engineer Etienne Totti, has 16 arch-supported slab spans. It was begun in 1922-23 with the short-term span section on its southern end. It was resumed about 1930 and the structure was finished in 1932. In use until the railroad folded due to bankruptcy in 1957, it is now used as a pedestrian bridge. It is one of the few railroad remnants left in Puerto Rico, and definitely the best preserved bridge.

THE SAN ANTONIO CHANNEL

The San Antonio Channel's coastline was originally covered by mangrove growths, especially along its northern shore. The channel's southern coast was next to deeper, moving water. Originally about 200 meters wide, the channel's coastline and width was first altered by the construction of the 16th Century's causeway approaches. The shallow water west of the northern causeway, between the San Juan islet and the bridged water passage between its two parts, remained covered by mangrove up to the 1880s. The garrison of Fort San Antonio kept a small pier between the mangroves and the western side of the fort. Once the coastlines were deprived from the protection of the mangroves, additional fill had to added next to these features to protect them from currents and wave action.

Between c.1886 and 1924, in order to facilitate the construction of the next three bridges, the western parts of the northern and southern channels' coastlines were brought inward and made parallel to each other with fill dredged from the bottom of the channel and adjacent San Juan Bay. As a result, today they are approximately in line with the position of the southern end of the fort on the north and with the 17th Century approach of the stone bridge on the south.

THE CONSTRUCTION OF PUENTE SAN ANTONIO

Highway construction in Puerto Rico had a peak in the 1920s. Among the reasons were the rapid expansion of the US automobile industry and its effects in Puerto Rico, an economic expansion in Puerto Rico, and the introduction of new machinery and techniques for highway building and their cost-reducing effects. The bridges built in that period included a new bridge over the San Antonio Channel, parallel to Gisbert's 1894 structure for the Carretera Central. This

new bridge was planned as part of a highway parallel to the Carretera Central in San Juan and Santurce. This new highway was named Manuel Fernández Juncos in Santurce and Luis Muñoz Rivera in the islet, where it would mainly serve the dock area.

In September 4th, 1924, the construction of what was referred to then as either the new or the second Puente San Antonio was assigned to contractor Robert Prann, who began work two months later. Its cost was estimated to be $121, 999.86, and resulted in an actual $165, 268.73. Construction was concluded in 1925. Its pile foundations merited an article in the journal *Revista de Obras Públicas* of 1925.

As soon as this new Puente San Antonio was finished, work began on the replacement of the Carretera Central's narrow 1894 truss bridge with a steel and concrete structure similar in style to the new railroad and highway bridges. The second new structure, finished in 1927, was officially named Puente Guillermo Esteves, although it is still referred to as Puente del Agua.

DESIGNER

Puente San Antonio was designed by Puerto Rico's most prolific and successful bridge designer, Eng. Rafael Nones. It was built by Eng. Robert Prann, an American contractor-engineer who produced several important works in Puerto Rico, including some San Juan docks and piers. It has suffered no significant alterations since.

Both San Antonio Channel highway bridges (San Antonio and Guillermo Esteves, HAER Nos. PR-35 and PR-36 respectively) were designed by Eng. Rafael Nones, the most prolific and successful bridge designer in Puerto Rico between 1910 and 1930. They were designed after the first phase of the concrete reconstruction of the neighboring railroad bridge, and they matched its style of concrete pier and arch. The two highway structures were conceived as monumental bridges, and provided with ornamentation such as balustrades, cast iron lamp posts and corner pieces or pilasters. Eng. Nones is identified in the historic context of the Multiple Property Nomination of Historic Puerto Rican Bridges as a master builder.

BRIDGE SURROUNDINGS

The location of this bridge contributes to an urban-coastal landscape of great beauty. The area is surrounded by sites of great interest in Puerto Rico's history, including the remains of Fortín San Antonio. Fort San Jerónimo and the Normandie Hotel, recently restored to its old splendor, are close by. The old Muñoz Rivera Park Powderhouse is also nearby. A famous dog-shaped rock formation that writer Coll y Toste immortalized in a legend is visible at the mouth of the lagoon, between Fort San Jerónimo and Condado. Puerto Rico's First International Airport, nowadays used for small airplanes only, and the lands of the old beach recreational center founded by Félix Benítez-Rexach, the Escambrón Beach Club, are also close.

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Abbreviations:

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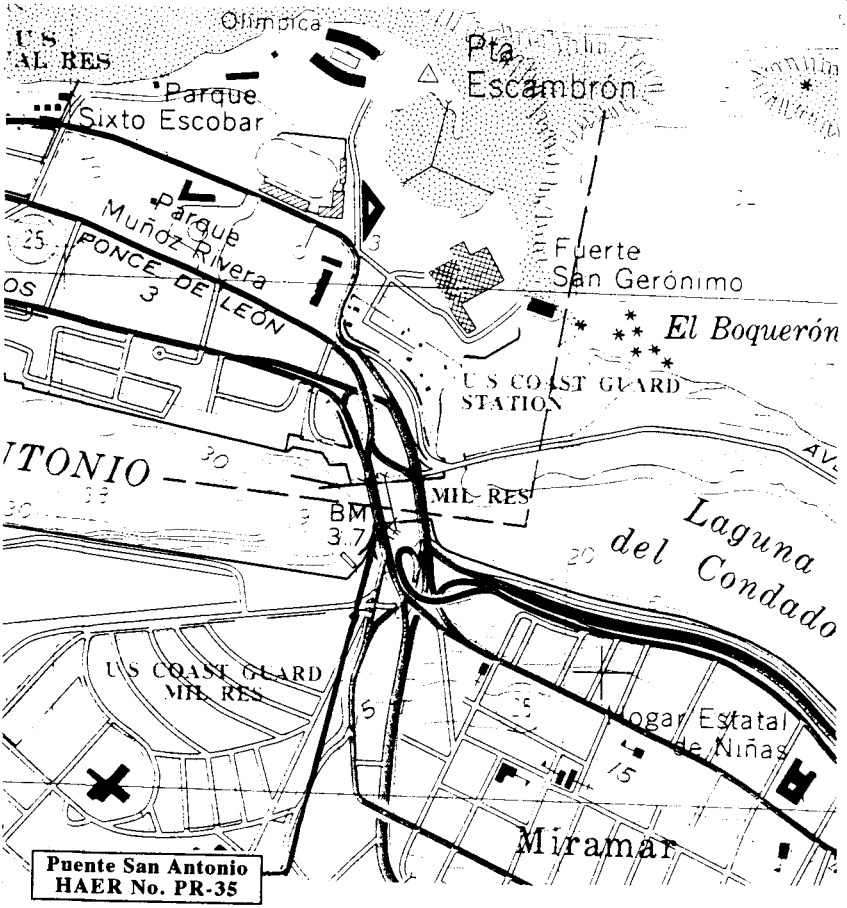

LOCATION PLAN
NOT TO SCALE